Citation:

Backstrand JR, Goodman AH, Allen LH, Pelto GH. Pulque intake during pregnancy and lactation in rural Mexico: Alcohol and child growth from one to 57 months. *Eur J Clin Nutr.* 2004 Dec; 58 (12): 1,626-1,634.

PubMed ID: 15280906

Study Design:

A prospective cohort study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine maternal intake of a mildly alcoholic beverage called pulque, during pregnancy and lactation, and its potential effect on postpartum child growth and attained size.

Inclusion Criteria:

- Data on maternal diet during pregnancy and child anthropometry at one and 57 months was previously collected by the Mexico Collaborative Research Support Program in Human Nutrition (NCRSP)
- Infant births that occurred between October 1984 and November 1985
- The subjects were mother-infant pairs.

Exclusion Criteria:

Exclusion criteria were not listed.

Description of Study Protocol:

Recruitment

- This study was based on data collected by the Mexico NCRSP
- Recruitment was based on births that occurred in the project villages between October 1984 and November 1985.

Design

A prospective cohort study.

Statistical Analysis

- All statistical analyses were performed using SAS v. 8.2.
- Multiple regression was used to model attained size at 57 months and growth between one and 57 months
- The adequacy of the multiple regression models was assessed using residual plots and influence statistics
- All variance inflation factors for the regression analyses were well under three, which indicates that multi-collinearity was not excessive
- All correlations are Spearman's rank-order correlations. PROC LOESS, which employs a locally weighted regression technique, was used to illustrate the curvilinear relationships between pulque intake and child size and growth.

Data Collection Summary:

Timing of Measurements

- Maternal measurements were collected monthly and infant weights, lengths, skinfolds and circumferences were measured at birth, eight days and monthly thereafter, until eight months
- In the follow-up study, weights and heights of the children at a mean age of 57 months were obtained by a trained nurse at the Solis clinic.

Dependent Variables

- *Variable 1:* Infant attained size at 57 months
- *Variable 2:* Infant growth between one and 57 months.

Independent Variables

- Maternal pulque and alcohol intake during pregnancy and lactation was estimated from dietary intake data for two consecutive 24-hour days monthly, during pregnancy and lactation
- Average number of records per participant was 9.5±4.8 days during pregnancy; 11.2±18 days during lactation.

Description of Actual Data Sample:

- *Initial N:* 108 maternal-infant pairs
- *Attrition (final N):* 58 maternal-infant pairs
- *Age:* Infants were recruited at birth; the mean age of mothers was 30.4 years
- *Ethnicity:* Hispanic/Latino
- *Other relevant demographics:* Mean years of schooling of mothers was 2.3.
- *Anthropometrics:*
    - Mothers' mean height was 152.5±5.5cm and
    - Mothers' mean weight and BMI (30 days postpartum) was 57.1±7.9kg and 24.6±2.6kg/m^2
- *Location:* Six villages in rural, central Mexico.

Summary of Results:

Key Findings

- During pregnancy, 69% of women reported alcohol consumption during pregnancy, all in the form of pulque
- Among the pulque drinkers (N=40), the median ethanol consumption was 125.1g per week and 30% of drinking mothers reported consuming more than 200g per week of ethanol
- The average ethanol intake per sitting was 23.5g, or slightly less than the alcohol content in two American beers
- During lactation, 72.4% of mothers reported pulque consumption. Pulque consumption during pregnancy and lactation were highly correlated (R=0.69, P<0.0001)
- The tallest and heaviest children tended to have mothers who consumed little or no pulque (50 to 300ml) during early lactation and small-to-moderate amounts of pulque intake during pregnancy. (Correlations between pulque intake during pregnancy with height for age was R=0.39, P=0.0131; weight for age, R=0.26, P=0.10; correlations between pulque intake during lactation with height for age, R=0.45, P=0.0025; weight for age, R=0.39, P=0.0111.)
- Child growth between one and 57 months showed little relation to maternal pulque intake during pregnancy. However, heavier maternal pulque intake during lactation was associated with slowest weight (P=0.0006) and linear growth (P=0.0002)
- The best predictors of larger child size and better growth were a lower proportion of days with heavy pulque intake, less pulque intake per drinking day and fewer drinking events per day.

Spearman's Correlations of Attained Size and Growth Measures with Maternal Intake of Pulque During Pregnancy (N=40) and Lactation (N=42)

Variables	57 Months	57 Months	One to 57 Months	One to 57 Months
	Height-for-Age	Weight-for-Age	Linear Growth	Weight Growth
Percent of days that pulque was consumed	Preg: -0.41, P<0.01 Lact: -0.49, P<0.001	Preg: -0.32, P<0.05 Lact: -0.41, P<0.01	Preg: -0.07 Lact: -0.42, P<0.01	Preg: -0.10 Lact: -0.39, P<0.05
Percent of days with heavy drinking	Preg: -0.32, P<0.05 Lact: -0.41 P<0.01	Preg: -0.19 Lact: -0.32, P<0.05	Preg: -0.23 Lact: -0.40, P<0.01	Preg: -0.20 Lact: -0.33, P<0.05
Mean amount consumed per drinking day	Preg: -0.15 Lact: -0.37 P<0.05	Preg: -0.05 Lact: -0.30	Preg: -0.09 Lact: -0.38, P<0.05	Preg: -0.04 Lact: -0.35, P<0.05
Mean amount consumed per drinking event	Preg: -0.14 Lact: -0.15	Preg: 0.20 Lact: -0.18	Preg: 0.11 Lact: -0.24	Preg: 0.14 Lact: -0.28

Mean number of drinking events per day	Preg: -0.34, P<0.05 Lact: -0.45, P<0.005	Preg: -0.28 Lact: -0.34, P<0.05	Preg: -0.22 Lact: -0.32, P<0.05	Preg: -0.17 Lact: -0.31, P<0.05

Author Conclusion:

- Pulque is a nutrient-dense, mildly alcoholic beverage that is consumed in large quantities by many Mexican women
- This study reveals a curvilinear association between pulque intake during pregnancy and child height at 57 months, such that the tallest children were those whose pregnant mothers had consumed low to moderate quantities of pulque
- Due to the micronutrient content of pulque and its central role in a rural Mexican diet that is often lacking in a range of vitamins and minerals, it is suggested that low to moderate pulque intake may have fostered better fetal growth in this population
- Unfortunately, heavy ethanol intake during pregnancy can seriously damage normal fetal growth and development and have a long-lasting impact on child size. Heavier pulque intake during lactation was associated with smaller attained size at 57 months and slowed growth between one month and 57 months. This may be due to impaired breastfeeding performance.

Reviewer Comments:

- *Strengths of this study include dietary assessment via multiple 24-hour recalls during both pregnancy and lactation, investigation of both attained size and postpartum growth and adjustment for a range of potential confounders. However, the study is observational in design and a range of alternative explanations might explain these associations. Also, the sample size is small and are not a perfect representation of the larger population*
- *Overall, the analyses show heavy maternal intake of pulque during pregnancy was associated with smaller child height and weight at 57 months of age. Heavier pulque intake during lactation was associated with poorer child growth between one and 57 months and smaller attained size at 57 months. Further research is needed to fully understand the risks associated with maternal intake of pulque.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes

2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	???
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	Yes
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	Yes
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	N/A
9.1.	Is there a discussion of findings?	Yes

	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes